in three divisions:—The graduate department, in which arrangements are made for the instruction of advanced students in the higher branches of science and literature; the medical department, in which students (men and women) who have already received a liberal education are received as candidates for the degree of M.D., and in which doctors of medicine may attend special courses; the collegiate department, in which students receive a liberal education leading to a degree. The Armour Institute of Technology was founded in 1892, and the work of instruction was begun in September, 1893. Courses are now offered in mechanical engineering, electrical engineering, civil engineering, chemical engineering, fire protection engineering, general science, and architecture, and all lead to the degree of Bachelor of Science.

IN the course of an address on degree day, July 8, at the University of Liverpool, Lord Derby, the chancellor, said that since they last met they had several new laboratories, some complete and some in progress. Another building, to be opened in November, will be for the study of natural history. They had also an extension to record of the chemical laboratories, to provide accommodation for the department of physical chemistry, and an addition to the existing department. This had been provided at an estimated cost of 10,500*l.*, which the president of the council, Mr. E. K. Muspratt, had promised to contribute. Since they last met 10,000*l.* had been given by Mrs. Barrow, the borough of Birkenhead had given an annual grant of 500*l.*, and a grant of 10,000*l.* had been received from the Liverpool City Council, 1000*l.* from the county of Lancaster, from Cheshire 300*l.*, and from the borough of Bootle 500*l.* The sum of 1500*l.* had been given to endow a lectureship in memory of Sir William Mitchell Banks. Mr. E. Whitley had promised 1000*l.*, and under the will of the late Mr. J. L. Bowes the University would receive a legacy of 8000*l.* for the benefit of the department of chemistry and other purposes. The company subsequently proceeded to the new electrotechnical laboratory, and Sir Joseph Swan formally opened the building, which he described as eminently suited for the purpose for which it was intended. The cost of the laboratory has been defrayed by a sum of 12,000*l.*, drawn from the university fund, and the Lancashire County Council has contributed 1000*l.* towards meeting the more pressing demands for equipment.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 18.—"On the Chemical Mechanism of Gastric Secretion." By J. S. **Edkins.**

June 8.—"On the Application of Statistical Mechanics to the General Dynamics of Matter and Ether." By J. H. **Jeans.** Communicated by Prof. J. Larmor, Sec.R.S.

The object of the paper is to apply the methods of statistical mechanics to questions connected with radiation and the energy of the ether. An attempt is made to examine whether or not the modern theory of thermodynamics of radiation can be regarded as resting on sound dynamical principles. The result arrived at is that the use made of the second law of thermodynamics in this theory, in particular in the proof of Stefan's law, is one which cannot be justified, and hence that those parts of the theory of thermodynamics of radiation which are based upon the use of the second law must be regarded as unsound.

The problem is obtained in its simplest form by considering either a finite universe, or else a finite portion of an infinite universe, enclosed within a perfectly reflecting boundary. Let the number of degrees of freedom of the matter inside this boundary, neglecting the interaction with the ether, be N, so that there are 2N coordinates of the aggregate system which very nearly represent motion of matter only. The number N is known to be actually finite, although it may be supposed to be so large that the error involved in treating it as infinite will be negligible. Let the number of degrees of the ether be M, giving 2M coordinates to the aggregate system. If we suppose the ether to have an absolutely continuous structure, the number M will be absolutely infinite.

The energy of the 2M coordinates of the ether is expressible as a sum of 2M squares. The energy of the 2N material coordinates may, again neglecting small terms, be divided into kinetic and potential energy. The kinetic energy is expressible as a sum of N squares, namely, the sum of the three components of energy of each electron of which the matter is composed. Thus the total energy is expressible as the sum of 2M+N squares, plus an unknown potential energy of electrons. It now follows, as in the proof of the well known theorem of equipartition of energy, that after an infinite time the sum of any p of these squares stands to the sum of the remaining q squares in a ratio which is equal to p/q, subject only to the condition that p and q are large enough to be treated as infinite without appreciable error. Since 2M and N satisfy these conditions, it follows that the system tends towards a state in which the energy of the ether is infinite in comparison with the kinetic energy of the matter. In other words, there is a general tendency for the ether to gain energy at the expense of matter.

It is, however, obvious that our own universe is at present far removed from its final state, so that the study of this final state is of less interest than the study of the stages through which the final state is being reached.

In discussing the transition to the final state, a principle proved elsewhere ("The Dynamical Theory of Gases," chapter ix.) is of service. Suppose that a vibration of any dynamical system is influenced by an external agency. Then the principle in question asserts that the ultimate effect of this influence is infinitesimal, except when the external agency changes to a considerable extent in a time comparable with the period of the vibration. If the time of change in the external agency is n times the period of the vibration, where n is large, then the ultimate change in the energy of the vibration vanishes to the same order as e^{-n}, a quantity which soon becomes negligible as n increases.

Thus, if θ is some small interval of time, so small that the material system may be regarded as perceptibly unaltered through a time θ, then the change produced in the energy of ether vibrations of which the period is less than θ will be very slight. The energy of such vibrations may therefore be treated as though it were incapable of change, so long as our consideration of the system does not extend over a very long period.

The total number of modes of vibration of any enclosed or unenclosed piece of ether is, as has been said, either very great or infinite, but the number of vibrations of an enclosed piece of ether *of which the frequencies are below an assigned value* is finite. Thus, we can now suppose M replaced by some small number M′, and the value of M′ will be finite. So long as we limit our consideration of the system to a finite time, say a million years, we may regard the energies of the remaining modes of vibration as constant and very small. The ratio of ethereal to material kinetic energy is now $2M'/N$, a quantity which cannot be infinite and may be very small.

If θ is a small time satisfying the conditions specified, then the rate at which an ether vibration of high frequency p gains energy will involve a factor $e^{-p\theta}$, so that the time required for the vibration to acquire a perceptible amount of energy will involve a factor $e^{p\theta}$. This is, of course, only true when $p\theta$ is large. The energy of those vibrations for which $p\theta$ is not large is rapidly adjusted, and a state will soon be reached in which these vibrations have the share of energy allotted to them by the theorem of equipartition of energy. With the progress of time the energy of the remaining vibrations gradually becomes perceptible, until ultimately the final state is reached.

We cannot, however, realise in nature the boundary impervious to all forms of energy, so that it is important to consider whether these predictions have to be modified if the boundary, instead of being perfect, is simply as perfect as we can make it.

It is found that there is no longer any tendency for the energy of the matter, even after infinite time, to vanish in comparison with that of the ether inside the enclosure; the two tend to assume a finite ratio, although neither of the actual energies can be permanent, as the system

inside the enclosure is no longer a conservative system. This definite ratio between matter and ether, however, lends a meaning to the expression "radiation at a given temperature," at any rate so long as we are concerned with the same enclosure and the same enclosed matter.

Stefan's empirical law states that the radiation is proportional to the fourth power of the absolute temperature, and Bartoli and Boltzmann have attempted to raise the law to the level of a theoretical law.

Their argument rests fundamentally upon the application of Carnot's principle to the working of a heat engine, in which the working substance is the ether.

Carnot's principle is, in effect, identical with the second law of thermodynamics, and this in turn is a special case of a special proposition in statistical mechanics. In the present investigation the most general methods of statistical mechanics are used, and the conclusion arrived at is different from that of the second law. The general investigation ought, of course, to take precedence over the attempted extension of the special case. It is, moreover, easy to find the exact point at which the general argument parts company with that used in the special case. In the special case, we are dealing only with forms of material energy such that there is an easy and rapid transfer of energy to the final state. The increase of entropy indicates simply the tendency to move towards this final state, and Carnot's principle is seen to be a special case of this general tendency in which it is supposed that the working substance is at every instant in the final state appropriate to its energy at that instant. When the ether is in question, it is found that the transfer of energy to vibrations of short wave-length, instead of being infinitely rapid, is, in point of fact, extremely slow, so that we never have to deal with a final state at all.

Moreover, it has to be assumed for Bartoli's argument that the energy of the working substance is a function of only two independent variables, *e.g.* the temperature and the density. This is not true in the case of an engine in which ether is the working substance; the ether energy is the sum of a number of vibrations of different wave-lengths, and the number of vibrations which have to be included in this sum will depend on the nature as well as on the temperature of the matter with which the ether is in communication.

Again, in the proposed argument for Stefan's law, the piston of the pump forms a moving boundary for the ether. The action of such a pump would change the frequency of vibrations in the ether, and energy which at one instant belonged to a vibration of one period would, after passing through the pump, belong to a vibration of some entirely different frequency. The energy of the vibrations of high frequency no longer remains unaltered and very small, for there is a transfer of energy to these vibrations at every stroke of the pump. The system will rapidly assume the final state appropriate to the value of this total energy, and this is a state in which the energy of matter vanishes in comparison with that of ether. Thus Bartoli's proof might be applicable to a universe in which pumps of the kind assumed had an actual existence, but has no application to our own universe in which the vibrations of highest frequency do not come into play at all.

It now appears that in attempting to obtain a law of radiation in conformity with the analysis of the present paper, we shall not be able to use any method so general as that of the second law of thermodynamics. The whole question is not one of partition of energy, but of transfer of energy.

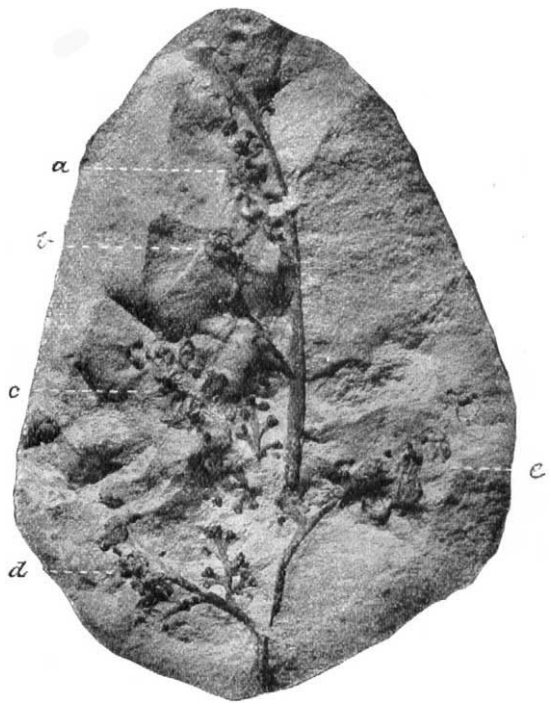
"The Microsporangia of Lyginodendron." By R. **Kidston,** F.R.S.

In a preliminary note a description was given of the microsporangia of *Sphenopteris* (*Lyginodendron*) *Höninghausi,* Brongt. It had been thought by some that the *Telangium Scotti,* Benson, might be the microsporangia of Lyginodendron, but the discovery of sporangia possessing all the characters of Crossotheca, Zeiller, in organic connection with the sterile foliage of *Lyginodendron* (*Sphenopteris Höninghausi*) shows that *Telangium Scotti* must belong to another plant.

The members of the genus Crossotheca (of which several species are known) had previously been regarded as *true ferns,* but now they must be classed with the Pteridospermeæ. The barren foliage of the species included in Crossotheca is very varied, and though the majority of the species possess sphenopteroid pinnules, one at least bears pinnules of the pecopteroid type.

In *Sphenopteris* (*Crossotheca*) *Höninghausi* each "fertile lobe bore six to eight broadly lanceolate sharply-pointed microsporangia. In the early condition the sporangia are bent inwards, and form a small hemispherical bunch with their apices meeting in the centre. At maturity the sporangia spread outwards, when they appear as a fringe hanging from the margin of the fertile pinnule, but are in reality connected for some distance to its lower surface. The microsporangia are bilocular, the parallel loculi being only separated by a narrow band of tissue. Dehiscence took place by a longitudinal cleft which passes down the inner surface of the sporangium in the line of the dividing wall of the two loculi."

The figure shows a penultimate pinna enlarged two



times. The ultimate pinnæ *c* and *d* bear sterile pinnules at their base, above which are some fertile pinnules. These latter, however, are better seen at *e*.

It has previously been shown by Prof. Oliver and Dr. Scott that the "seed" of *Sphenopteris Höninghausi* is the *Lagenostoma Lomaxi* of Williamson. *Sphenopteris Höninghausi* is thus the first pteridosperm of which the male and female organs are known.

The specimens described were derived from the 10-foot Ironstone-measures, Coseley, Dudley, which belong to the Westphalian series of the Coal-measures, and were communicated to the author by Mr. H. W. Hughes.

Royal Microscopical Society, June 21.—Mr. G. C. Karop, vice-president, in the chair.—Dr. **Lazarus-Barlow** exhibited and described a new form of warm stage, devised by him, that could be heated by oil or gas.—Mr. Cecil R. C. **Lyster** exhibited an improved form of warm stage, heated by electricity.—Mr. C. L. **Curties** exhibited an arrangement for obtaining dark ground illumination with high powers, which had been suggested to him by a contrivance made by Leitz for attaining this object. He showed *Pleurosigma angulatum* on a dark ground under a 1/12-inch oil immersion objective.—Mr. **Rheinberg** directed attention to an experiment showing that the ap-

pearance of a grating could be produced in the field of the microscope without there being anything on the stage. The lines seen were achromatic interference bands produced with the help of two of Thorp's gratings of equal pitch placed behind the objective.—Mr. **Rousselet** directed attention to a living specimen of *Plumatella punctata* (Hancock) sent by Mr. Hood, of Dundee. The rare freshwater polyzoon has apparently not been recorded in England since its discovery by Hancock in 1850. It differs from other species of Plumatella mainly in having a soft, transparent ectocyst.—A communication by Mr. E. M. **Nelson** on the tubercle bacillus was taken as read.—Mr. A. E. **Conrady** gave a *résumé* of his second paper on theories of microscopic vision. In his former paper he dealt with the formation of the image of a simple plane grating, showing that it could be fully accounted for on the basis of Abbe's theory. In the present paper he considered more complicated structures, such as dot- and cross-line patterns.

Geological Society, June 21.—Dr. J. E. Marr, F.R.S., president, in the chair.—The relations of the Eocene and Cretaceous rocks in the Esna-Aswan reach of the Nile Valley: H. J. L. **Beadnell.** At the meeting of the International Geological Congress held in Paris in 1900, the author brought forward evidence from the Baharia Oasis and Abu Roash to show that there was a marked unconformity between these two systems in the northern part of the country. The Jebel-Awaina succession shows that in the southern part of the country, where the Upper Cretaceous and the Lower Eocene occur in their fullest development, there is no sharp line of demarcation between the Cretaceous and the Tertiary, and no disturbances in the stratigraphical succession. This is confirmed by the succession in the Kharga Oasis, where there is no trace of an unconformity. Dr. J. Ball's conclusions to the contrary were mainly based on the supposed irregular variation of the Esna Shales; but, where this occurs, it is mainly due to the fact that, with a slight increase of carbonate of lime, these beds became almost indistinguishable from the overlying marls and marly limestones of the Eocene. The author finds in Jebel Nur el Ghenneiem some 180 feet of green clays between the *Echinocorys*-Chalk and the Eocene marls and limestones, and a perfectly conformable succession throughout. Near Ain Amur there is a considerable development of fossiliferous limestones at the summit of the Cretaceous rocks, and many of the fossils are hardly distinguishable from Eocene species. The author is of opinion that the Farafra succession falls into line with that which obtains in the southern part of the country. An important piece of confirmatory evidence is furnished by the discovery of a rich fauna in "ashen-grey clays" in the Esna-Aswan reach of the Nile Valley by Dr. W. F. Hume, in the clays above the *Pecten*-Marls in the neighbourhood of Esna.—A contribution to the study of the Glacial (Dwyka) Conglomerate in the Transvaal: E. T. **Mellor.** The survey of a district lying east of Pretoria and extending from near the diamond-fields to Middelburg has recently afforded much additional information with regard to the Glacial Conglomerate in this part of South Africa. The district lies on the northern edge of the principal area occupied by the Karroo system, and includes a number of outliers, the area between which affords information as to the source of the material of the Conglomerate and the character of the land-surface on which it was deposited. This surface is smoothed, grooved, and scratched by ice-action. The Karroo system is here only 400 or 500 feet thick, and the Conglomerate usually about 50 feet; but, where deposited in hollows, it may reach 200 feet or more in thickness. The fragments are usually from 1 to 3 feet in diameter, but may attain as much as 8 or 10 feet; they are often facetted and sometimes show striations. The majority of the boulders are of local origin. True bedding-planes are rare in the conglomerate, but there are included patches of sandstone, mudstone, or shale, some of which show ripple- or eddy-markings. The striæ are remarkably constant in direction, and they and the transport of boulders indicate an ice-movement from the north-north-west to the south-south-east. In the Prieska district Rogers and Schwarz found the movement to have been from north-north-east to south-south-west, and the same direction is given by Schenck from near the junction of the Orange and Vaal Rivers. During 1904 outliers of the Conglomerate were found farther north, near the junction of the Elands and Olifants Rivers.—On new Oolitic strata in Oxfordshire: E. A. **Walford.**—The causes of variegation in Keuper Marl and in other calcareous rocks: G. T. **Moody.** The author concludes that the variegation of the Keuper Marls and of other calcareous rocks has been brought about by the percolation of chalybeate water through the light-coloured mass, the more porous parts of which have in consequence become stained with ferric oxide, while the harder and more crystalline parts, being non-porous, have remained unchanged. The uniformity in distribution of ferric oxide in some red rocks, such as the New Red Sandstone, suggests that the iron contained in them has probably been derived from chalybeate water in a similar manner.

Challenger Society, June 28.—Dr. R. N. Wolfenden in the chair.—Dr. H. R. **Mill** exhibited the new chart of the world, recommended by the International Geographical Congress, and published at the cost of the Prince of Monaco. From 72° N. to 72° S. are sixteen sheets on Mercator's projection; each polar chart of four sheets is on a circular projection. The submarine contours and soundings are in metres, symbols indicating the bottom deposits. The land is black; the contours of the ocean are coloured in deepening shades of blue. Meridians (from Greenwich) and parallels are ruled for each degree.—Dr. W. T. **Calman** exhibited the two Decapoda brought from the Antarctic region by the *Discovery*, *Cranzon antarcticus* and *Chorismus antarcticus*, and explained their bearing on "bipolarity."—The **Secretary** showed a chart reproduced in line-process from one of the society's blank charts, in order to show the method of preparation.—On behalf of Messrs. E. W. L. **Holt** and W. M. **Tattersall**, Dr. Calman read a preliminary note on the Antarctic Schizopoda captured by the *Discovery*. The collection contained several new species of Euphausiidæ and Mysidæ, and the authors were able to show that *Euphausia superba* (Dana), Sars, *E. Murrayi*, Sars, *E. australis*, Hodgson, *E. glacialis*, Hodgson, and *E. antarctica*, Sars, are all referable to a single species.—The **Secretary** read a note on the probable time required by the larva of an epibenthic animal to cross the Atlantic, and made some remarks on the desirability of revising the nomenclature of ocean currents on an international basis.

PARIS.

Academy of Sciences, July 3.—M. Troost in the chair.—The theory of algebraic surfaces: **Émile Picard.**—The propagation of waves along a liquid compressible column, composed of strips of unequal velocities and filling an elastic horizontal tube, without longitudinal tension: J. **Boussinesq.**—On camphoacetic and β-camphopropionic acids: A. **Haller.** Methyl camphocarbonate heated with sodium methylate and iodoacetic ester gives methyl carboxymethylcamphoacetate, which, with alcoholic potash, furnishes camphoacetic acid. A corresponding compound is obtained by substituting ethyl β-iodopropionate for the ethyl iodoacetate in the original reaction, and from which β-camphopropionic acid is obtained.—On the existence in the black elder of a compound furnishing hydrocyanic acid: M. **Guignard.** The number of plants from which hydrocyanic acid can be obtained is increasing every year, and it has been suggested that it represents the first recognisable product of the assimilation of nitrogen in plants. In the elder, the fresh leaf furnishes the largest proportion of the acid, averaging 0·01 per cent.—Synthesis of the three tertiary dimethylcyclohexanols and of the hydrocarbons connected with them: Paul **Sabatier** and A. **Mailhe.** The cresols are converted into methylcyclohexanones by means of the reduced nickel reaction, and these are converted by methylmagnesium iodide into the corresponding tertiary alcohols, good yields being obtained. The preparation, physical properties, and reactions of the ortho-, meta-, and para-tertiary alcohols are described.—On the evolution of the tertiary mammals. A reply to the observations of M. Boule: Charles **Depéret.** A controversial note dealing more especially with the ancestry of the horse and bear.—M. P. Curie was elected a member

in the physical section in the place of the late M. A. Potier.—On the specific inductive power of metals in the case of the calorific and luminous waves: André **Broca.** The author concludes that the hypothesis of the existence of a considerable specific inductive power for the metals, although perhaps not sufficient to explain all the optical properties of metals in detail, is at least no more in contradiction with the facts than the hypothesis of Planck that this specific inductive power is zero.—An apparatus for measuring the factors, penetration, and quantity of X-rays, and a radiophotometric totaliser: G. **Contremoulins.** Silver plates of varying thicknesses are fixed on to rotating sectors, and the effect of interposing these in the path of the rays upon a phosphorescent screen is noticed.—The magneto-optical properties of ionoplastic iron: L. **Houllevigue** and H. **Passa.**—A method for establishing coloured screens, destined to isolate certain groups of special radiations: F. **Monpillard.** A given weight of a colouring matter is diluted to a certain volume with an aqueous solution of gelatin, and this poured on to a glass plate of fixed area, thus giving an invariable weight of colour per square centimetre. The author has succeeded in producing screens giving a maximum of luminosity in the green (λ 530), yellow orange (λ 588), yellow (λ 500), and red (λ 630).—The preparation of binary compounds of metals by thermochemical reactions: A. **Colani.** Some examples of the application of aluminium powder for reduction at a high temperature; the products are usually contaminated with aluminium and sometimes with iron.—The constitution and properties of the aluminium steels: Léon **Guillet.** So long as the percentage of aluminium is below 2 per cent., there is no marked change in the properties of the steel. Up to 15 per cent. the aluminium enters into solution in the iron, the iron-aluminium solution thus formed not dissolving carbon.—Combinations of ferrocyanides and sulphuric acid: Paul **Chrétien.** Hydroferrocyanic acid, dissolved in sulphuric acid without any gas being evolved, forms a sulphonic acid of the composition $H_3FeCy_6(SO_3H)$. With fuming sulphuric acid another compound is produced, $FeCy_6SO_2$, the decomposition and reactions of which have been studied.—A modification of the initial quality of iron and steel used in the manufacture of rivets consequent on the heating required in fixing: Ch. **Frémont.** It is found that the metal, after being heated and cooled under traction, is improved in quality mechanically.—On the acid γ-aldehydes: E. E. **Blaise** and A. **Courtot.** The authors have been successful in obtaining these aldedydes in a pure state for the first time. An unsaturated acid is treated with bromine, the dibromo-acid formed heated, a bromo-lactone being then formed by the loss of hydrobromic acid. Hydrobromic acid is then removed from this by boiling with quinoline, and the lactone thus produced, hydrolysed with an alkali, gives the acid aldehyde required.—The synthesis of the lactone of erythric acid: M. **Lespieau.**—A new method of synthesis of the monoatomic and polyatomic alcohols: V. **Grignard.** This important synthesis has been achieved by the author by acting with organometallic derivatives of the type RMgX on the halogen derivatives of the mono- or poly-atomic alcohols. The reaction takes place in two stages,

$$RMgX + ClCH_2.CH_2.OH = RH + ClCH_2.CH_2.OMgX,$$

and this on heating gives with a fresh molecule of a magnesium compound

$$R'MgX' + ClCH_2.CH_2OMgX = MgX'Cl + R'.CH_2.CH_2.OMgX.$$

The action of water on this last substance gives the alcohol $R.CH_2.CH_2.OH$. Several examples of the application of this synthetical method are given.—On β-decahydronaphthylketone and β-decahydronaphthylamine: Henri **Leroux.**—Some new derivatives of the mesoxalic esters: Ch. **Schmitt.**—The action of ethyl iodide on sparteine: Charles **Moureu** and Amand **Valeur.** The reaction gives sparteine iodohydrate and two isomeric iodoethylates.—The densities of carbonic anhydride, ammonia, and nitrous oxide: Philippe A. **Guye** and Alexandre **Pintza.** The results for the densities of nitrous oxide and carbon dioxide agree with those of Lord Rayleigh within the limits of experimental error, 1/6000 to 1/19,000. Special precautions were taken in the case of ammonia to ensure the absence of amines, the result being 1/700 lower than the figure of M. Leduc. The limiting densities for these gases were worked out, and the atomic weight of nitrogen deduced as 14·006.—The thermochemistry of neodymium: Camille **Matignon.**—The influence of the elements of brown flour on the extraction of the gluten and bread-making: M. **Lindet** and L. **Ammann.**—On the cause of the withering of the vines in Tunis, Algeria, and the Midi: L. **Ravaz.**—On the presence of a hydrocyanic glucoside in the leaves of the elder, *Sambucus nigra*: Em. **Bourquelot** and Em. **Danjou.** The elder leaf contains a glucoside containing nitrogen, which, under the influence of emulsin, gives glucose, hydrocyanic acid, and an aldehyde.—Modifications and *rôle* of the segmentary organs in some annelids: Louis **Fage.**—On the epipodites of the Eucyphote Crustacea: H. **Coutière.** On the discovery of coal at Abaucourt (Meurthe-et-Moselle): René **Nicklès.** A layer of coal, 2·65 metres thick, has been found at Abaucourt, near Nomeny. It is at a depth of 896 metres, and on chemical analysis proves to resemble the gas coal of Saarbrück.—Observations on the preceding note: R. **Zeiller.**—On the geology of the Pre-alps in the neighbourhood of Jaen: Robert **Douvillé.**—Contribution to the tectonic of the southern Carpathians: G. M. **Murgoci.**—On the origin of lactose. The ablation of the mammæ in lactation: Ch. **Porcher.**—The fixation of chemical substances on living cells: MM. **Charrin** and **Le Play.**

CONTENTS.